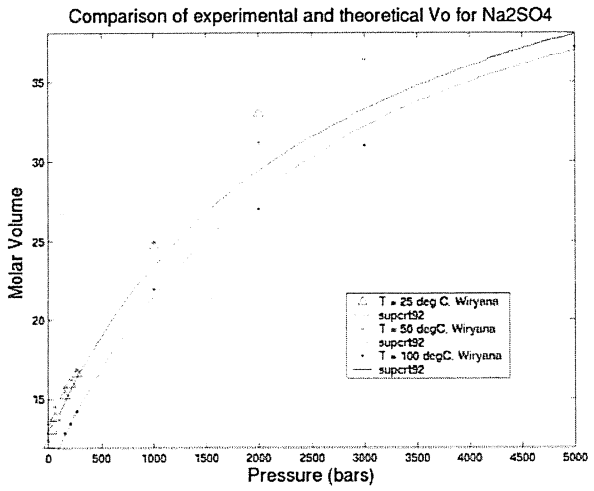
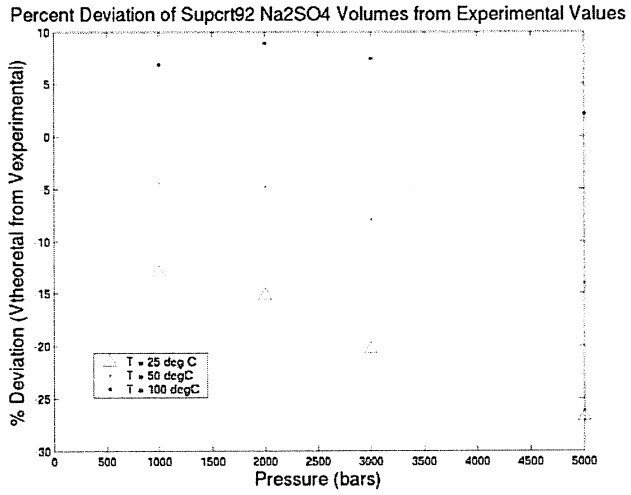
SUBSURFACE ACTION IN EUROPA'S OCEAN. [1]S. D. Vance, [1]J. M. Brown, [2]T. Spohn and [3]E. Shock, [1]NASA Astrobiology Institute, University of Washington, Seattle, svance@ess.washington.edu, [2]Institut für Planetologie, Münster, Germany, Chemistry Department, University of Arizona

Subsurface processes may have created observed surface features on Europa's ice. A key question is whether plumes originating from the rocky crust can reach the surface. Kimura and Kurita [1] treat a mechanically created plume while Thompson and Delaney [2] look at buoyancy and circulation after such a plume has formed. In addition to the obvious aspect of mechanical driving forces for fluid motion, the issue is intimately linked to composition, relative salinity, and heat distribution throughout the ocean. Since publication of [1] and [2], Hussman and Spohn have assessed tidal heating and dissipation in a more thorough manner. We tested the accuracy of chemical models in accounting for pressure effects and find supcrt92 sufficient for pressures in Europa's ocean (max 2000 atm) for predicting sulfate volumes at 50 °C while FREZCHEM has yet to incorporate pressure effects. The recent discovery of peridotite hydrothermal opens the possibility that a marriage of tidal and compositional effects may bears further activity in Europa's ocean.





Figures 1 and 2: Volume change of a pure water sample with addition of an infinitesimal amount of Na_2SO_4. Points represent experimental data from present authors. Plotted curves are comparison of predicted values from supcrt92. Figure 2 shows that there is less than 5% deviation at 50 °C up to a pressure of 2000 atm.

If peridotite was exposed in Europa's early days, hydrothermal systems certainly existed. Non-synchronous rotation of the europan crust may keep fresh peridotite exposed, leaving the possibility that such activity persists to the current time.

References: [1] Kimura, J. and Kurita, K. (2002) LPS XXXIII, Abstract #1492. [2] Thomson R.E. and Delaney J.R. (2001) JGR, 106, 12,355-12,365. [3] Hussman, H. (2003) Dissertation Thesis, Institut für Planetologie, University of Münster.